4 Overview of Protection Goals for Pollinators

T. Moriarty, A. Alix, and M. Miles

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4.1 INTRODUCTION

Management of cropping systems has evolved over the past decades in a response to higher demands for food and other products (e.g., fiber, fuel). Along with this has come an increased need to control pest populations and diseases. Pesticides have become an integral part of commercial production. Regulatory authorities serve a critical function in assessing and balancing the benefits of pesticides with other potential consequences of their use in order to maximize overall benefits to the societies they serve. Authorities articulate the objectives of their efforts in broad terms, such as "protecting human health and the environment" as a guide to their efforts (EFSA, 2010). At this level, multiple considerations in addition to estimated risk are considered when guiding the actions of a regulatory authority and may include economic, legal, or political considerations. Together, all the variables are considered and balanced in a way that produces an assessment that is consistent with the protection goals of a regulatory authority.

Regulatory authorities base their interest in assessing the potential impact of pesticides to a specific organism or taxon in different factors such as:

- the market value or the role an organism (or taxon) plays in ecosystem services, both in natural and cultivated systems;
- the estimation (e.g., estimated exposure values) or knowledge (e.g., test data or monitoring data) of actual or potential exposure of the species to pesticides;
- information on actual or potential impacts of pesticides on a taxon (e.g., incident reports or survey efforts); and
- the relevance of the species or taxon to a regulatory authority's protection goals.

Protection goals therefore reflect a certain level of information and certain values of a society. Regulatory authorities, in turn, use risk assessment tools to determine whether the use of a pesticide is consistent with

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its general goal, such as protecting human health and the environment. A risk assessment process must be designed to provide clear information for the risk assessor and risk manager to determine whether the proposed use of a pesticide product would or would not be consistent with the protection goals of a regulatory authority. General protection goals, however, do not necessarily inform or provide adequate guidance at the risk assessment level. Therefore, more specific protection goals may need to be considered which would be more appropriate for use at the risk assessment level. Specific protection goals, however, must be linked to the general protection goals. In this way, protection goals of a risk assessment (e.g., for a particular taxon or nontarget species) are consistent with and support the general protection goal of "protecting human health and the environment." Over time, entities such as the Organization for Economic Co-operation and Development (OECD), the US Environmental Protection Agency (EPA), and the European and Mediterranean Plant Protection Organisation (EPPO) have developed a number of documents to guide the risk assessment processes in support of decision making with respect to registering pesticides.

The participants came to the Workshop with an understanding of the value of honey bees and of the current science on potential exposure and effects of pesticides on bees. Participants spent time discussing specific protection goals for pollinators such that a pesticide risk assessment process for pollinators would be supportive of general protection goals of regulatory authorities.

From this discussion developed surrogate protection goals that served the Workshop participants as they developed recommendations for a pesticide risk assessment process, and for the data to inform that process. However, the participants of the Workshop were aware that, since protection goals reflect a range of considerations (including legal, societal, and resource considerations) that are specific to a government or authority, it was not within the scope of this effort to define the protection goal of any one country or protection authority.

4.2 ELEMENTS AND PROPOSED PROTECTION GOALS

During the Workshop, participants discussed the longstanding global importance of *Apis* and non-*Apis* bees in terms of both commercial and ecological significance. Participants of the Workshop agreed that a critical ecological service of pollinators (bees in particular) that needs to be protected is the maintenance of the pollinating function of these organisms. The goal would be to ensure adequate pollination (sufficient frequency of floral visits) to support healthy crop survival and yield. While such a protection goal is relevant for commercial agricultural production, it may not be relevant at a larger scale, that is, the landscape, where the role of non-*Apis* species is more relevant as these species pollinate adjacent cropland or the non-cropped landscape. For this to be taken into account, non-*Apis* (i.e., non-managed) pollinating insect species would need to be considered with their interactions in the larger landscape. While pollination remains the critical function of these species which ensures a healthy and ecologically diverse landscape, consideration of non-*Apis* species and their contribution to landscape ecology reflects the role that ecological diversity plays in supporting a healthy environment. Protection of the pollinator community at the landscape level ensures pollination services and also contributes to the diversity of the species associated with pollination services within that landscape. Finally, participants identified honey and other hive products as potentially a specific goal to be protected as well as a measure of honey bee health. Model (surrogate) protection goals upon which to build a risk assessment framework were then defined as:

i. protection of pollination services provided by both *Apis* and non-*Apis* species;
ii. protection of pollinator biodiversity (i.e., protection of adequate number and diversity of bee species that contribute to the health of the environment); and
iii. protection of honey production and other hive products.

4.3 LINKING PROTECTION GOALS WITH ASSESSMENT ENDPOINTS

With possible protection goals defined, they then had to be linked to risk assessment endpoints, and further linked to specific endpoints measured in either exposure or effects studies (i.e., measurement endpoints). Assessment endpoints are attributes of an entity (e.g., an organism or environmental component) that are essential for its continued survival. In ecological risk assessments for wildlife, assessment endpoints have traditionally been defined as the growth, reproduction, and survival of an organism. These same assessments can be applied to the honey bee, but it must be recognized that the honey bee functions as a superorganism and therefore the attributes of growth, reproduction, and survival apply to the colony, not the individual bee.

A risk assessment (e.g., for a particular taxon) is based upon data from one or several studies that provide sufficient information for the risk assessor to determine whether the intended use of a pesticide will have a significant adverse effect on one or more of the assessment endpoints. Data provided by specific studies should inform one or more of the assessment endpoints in either a direct fashion (e.g., treatment related mortality) or an indirect fashion (e.g., reduced foraging activity). Both exposure studies and effects studies produce measurement endpoints (e.g., pesticide residue levels in pollen, body length, adult bee longevity, or mortality of different castes or stages) informing the risk assessor whether the intended use of a pesticide results in a significant exposure and/or reduction in an organism's ability to either grow, reproduce, and/or survive. When measurement endpoints are appropriately linked to assessment endpoints and specific protection goals, they then support generic protection goals. Figure 4.1 shows the relationship between measurement endpoints, assessment endpoints, specific protection goals, and generic protection goals (Table 10.1 also gives more specific examples of protection goals, assessment endpoints, and measurement endpoints).

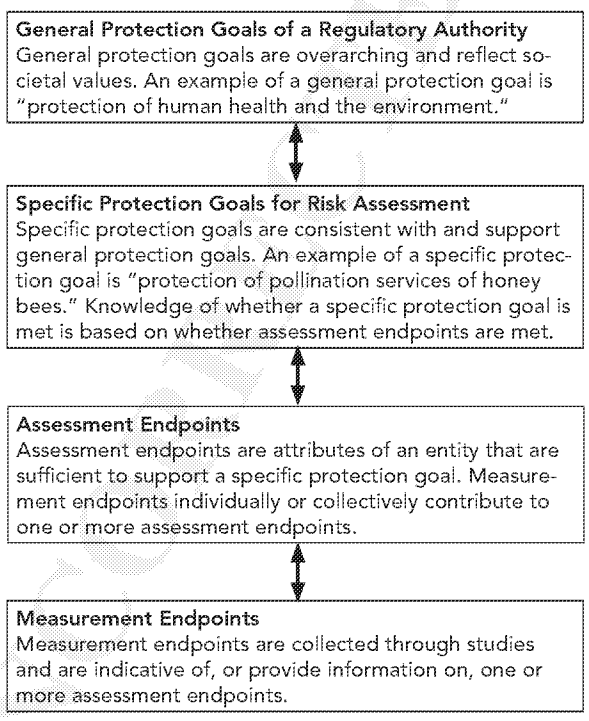

FIGURE 4.1 Relationship between measurement endpoints to generic protection goals, used in assessing ecological risks.

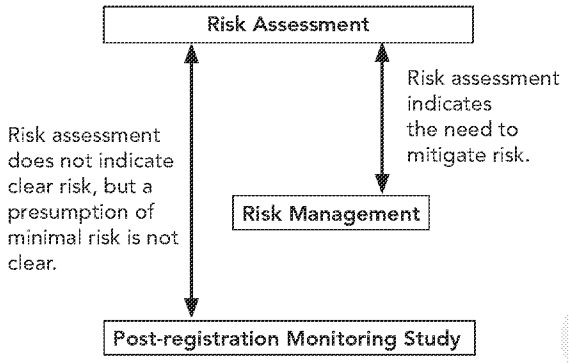

FIGURE 4.2 Post-registration monitoring studies in a risk assessment framework.

4.4 PROTECTION GOALS AND MONITORING

The risk assessment process proposed by the participants of the Workshop is designed to support the protection goals articulated at the Workshop. The process also provides an avenue for additional feedback information to continue to inform the assessment of risk. Confirmatory information, such as incident or monitoring data, provides direct feedback on whether the regulatory decisions are effective and whether specific and generic and protection goals are being achieved. However, field monitoring studies can be complex since they often reflect natural events/scenarios that impact bees, such as disease, predation, and competition. Thus, it is important that when defining protection goals, consideration is given to the risk assessment parameters and potential monitoring parameters in a way that makes the relationship between them clear. Figure 4.2 illustrates the relationship between risk assessment, risk mitigation techniques (i.e., risk management), and post-registration monitoring. The process described in Figure 4.2 would provide information on exposure, effects, or the effectiveness of mitigation measures.

4.5 CONCLUSION

Well-defined protection goals guide a risk assessment by providing criteria for decisions within the paradigm of risk assessment (study design and interpretation), risk mitigation, and/or post-registration monitoring actions to determine whether protection goals are met. Protection goals must be achievable and sustainable through appropriate scientific analysis and decisions (i.e., studies, management, and/or monitoring). During the Workshop, participants discussed the longstanding global importance of *Apis* and non-*Apis* bees in terms of both commercial and ecological realms. Participants developed model (or surrogate) protection goals suitable as the basis for a risk assessment framework. It was noted that both risk assessment and risk management are complementary options to meet protection goals. Therefore, suitable protection goals were defined as:

- protection of pollination services provided by *Apis* and non-*Apis* species,
- protection of honey production and other hive products
- protection of pollinator biodiversity, that is, protection of adequate number and diversity of bee species that contribute to the health of the environment (primarily non-*Apis* bees).

REFERENCES

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